MODULE Q BOOLEAN LOGIC · Q3

Truth tables for single gates

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 10.1, 10.2, 10.3(b), 10.3(c)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. Write truth table values as 1 and 0. Use the gate names **NOT**, **AND**, **OR**, **NAND**, **NOR** and **XOR**. The total for this worksheet is **22 marks**.

1

Total: 3 marks

(a) State what is shown by a truth table for a logic gate. **[1]**

(b) State the number of rows needed, not counting the heading row, in the truth table for: **[2]**

(i) a NOT gate _____

(ii) an XOR gate _____

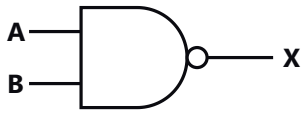
2

Total: 6 marks

Three logic gate symbols are shown. Each gate has output X.

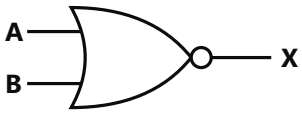
(a) Complete the truth table for **each** gate. **[6]**

Gate 1



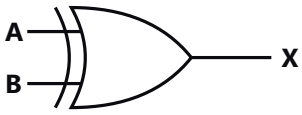
A	B	X
0	0	
0	1	
1	0	
1	1	

Gate 2



A	B	X
0	0	
0	1	
1	0	
1	1	

Gate 3



A	B	X
0	0	
0	1	
1	0	
1	1	

3 **Total: 4 marks**

The table shows the outputs of four different logic gates, E, F, G and H, for all possible values of their inputs A and B.

A	B	Gate E	Gate F	Gate G	Gate H
0	0	1	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	0	1	0	1

(a) Identify the logic gate that has been used for each of E, F, G and H. **[4]**

Gate E .....

Gate F .....

Gate G .....

Gate H .....

4 **Total: 3 marks**

(a) Complete the truth table for a NOT gate with input A and output X. **[1]**

A	X
0	
1	

(b) Explain how the output of a NAND gate is related to the output of an AND gate when both gates have the same inputs. **[2]**

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5 Total: 4 marks

A water treatment works has two pumps. A warning alarm is controlled by **one** logic gate with two inputs and one output.

Input / output	1 means	0 means
P (first pump)	the pump is running	the pump is not running
Q (second pump)	the pump is running	the pump is not running
W (alarm)	the alarm sounds	the alarm is silent

The alarm sounds when neither pump is running.

(a) Identify the logic gate needed. **[1]**

(b) Complete the truth table for the alarm. **[2]**

P	Q	W
0	0	
0	1	
1	0	
1	1	

(c) Write a logic expression for the alarm, W. **[1]**

6 Total: 2 marks

There are five logic gates that have two inputs. For two of them, the output is 0 in exactly **one** row of the truth table.

(a) Identify these **two** logic gates. For each one, give the values of inputs A and B in the row where the output is 0. **[2]**

Gate ..... **Inputs** .....

Gate ..... **Inputs** .....

Total for this worksheet: 22 marks